

REMARKS

Claims 1-37 are pending in the present application. In the above amendments, claims 1, 7, 11 and 15 have been amended. Claims 5-6, 13, and 17 have previously been cancelled without prejudice, and claims 35-37 have been added. Therefore, after entry of the above amendments, claims 1-4, 7-12, 14-16, and 18-37 will be pending in this application. Applicants believe that the present application is now in condition for allowance, which prompt and favorable action is respectfully requested.

Applicants respectfully respond to this Office Action as follows.

I. CLAIM OBJECTIONS

The Examiner has objected to claims 1, 7, 11, and 15 because of certain informalities. Specifically, for claims 1, 11 and 15, the Examiner has noted that the limitation of “the spatial filter” is recited prior to the first mentioning of the limitation as “a spatial filter,” and thus lacks antecedent basis. Applicants note that due to the amendments made to these claims, the antecedent basis has been corrected. Further, the Examiner notes that claim 7 depends on claim 5, which was previously cancelled. Applicants have amended claim 7 to depend on claim 1, a pending claim.

Based on the amendments made to the claims, Applicants respectfully request that the Examiner withdraw the objections to the claims.

II. REJECTION UNDER 35 U.S.C. §103

Claims 1-3, 5-6, 8-21, 25-26, 30, and 34 are rejected under 35 U.S.C. § 103(a) as being allegedly being unpatentable over Khatri, U.S. Patent Publication No. 2002/0127978 (hereinafter “Khatri”) in view Zhuang et al., U.S. Patent Publication No. 2003/0123381 (hereinafter “Zhuang”). The Examiner has also rejected claims 22-24, 27-29, and 31-33 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Khatri, U.S. Patent Publication No. 2002/0127978 (hereinafter “Khatri”) in view Zhuang et al., U.S. Patent Publication No. 2003/0123381 (hereinafter “Zhuang”) and further in view of Crilly, Jr. et al., U.S. Patent No. 6,611,231. These rejections are respectfully traversed.

Applicants disclose a novel and unobvious approach for reliably transmitting data in a wireless communications system under severe channel conditions. In one exemplary embodiment, as applied to a multi-carrier system, the reliable transmission is achieved using a MIMO (Multiple-Input Multiple-Output) system with OFDM (Orthogonal Frequency-Division Multiplexing). In this exemplary system, an OFDM signal is output from each antenna. The OFDM signal modulates data on a large number of closely spaced orthogonal sub-carriers, thus providing reliable communications when fading is present due to high level multi-path reflections. Moreover, each OFDM signal is transmitted on a different spatial channel. Thus, in this exemplary system, these spatial channels are orthogonalized through the use of steering vectors, thus allowing the receiver to separate the spatial channels without complex processing prior to OFDM demodulation.

Applicants respectfully note that the orthogonality imparted to the spatial channels in Applicants' approach is completely separate and apart from the orthogonality of the frequency carriers of the OFDM signals transmitted and received over the spatial channels. Nowhere in Khatri is there disclosed or suggested the concept of creating orthogonal spatial channels. Instead, the system as taught by Khatri operates to transmit signals in a direction that is optimized for doing so by measuring the angular power spectrum using a training signal. See Khatri, ¶ [0058]. Then, a transfer matrix is created at the receiver from the measured angular power spectrum for receiving the output data streams. See Khatri, FIG. 2, ¶¶ [0037]-[0039]. Although Khatri uses the mathematical concept of steering vectors, it does not teach nor suggest its use to create orthogonal spatial channels in a MIMO system.

Claims 1-3, 5-6, 8-21, 25-26, 30, and 34

Turning to the claims, Applicants respectfully submit that Khatri does not teach or suggest the invention as claimed in independent claims 1, 11, 15, 19, 26 and 30. For example, Khatri does not teach or suggest at least the limitation recited in claim 1 of:

obtaining a plurality of received symbol streams for a plurality of data symbol streams sent via a plurality of spatial channels of a MIMO channel in the wireless MIMO communication system, wherein spatial processing is performed at a

transmitter with steering vectors, which are estimates of transmitter steering vectors required to orthogonalize the plurality of spatial channels.

Claim 1 (emphasis added). Independent claims 11, 15, 19, 26 and 30 also contain similar limitations.

The Examiner relies upon Khatri to teach and suggest the orthogonalizing of spatial channels. Khatri does not teach or suggest this, as discussed above. Zhuang, the other reference cited by the Examiner, does not compensate for the deficiency of Khatri. Thus, Applicants respectfully submit that the presently pending claims are allowable over the cited art.

In addition, Applicants submit that claims 2, 3, 8-10, 12, 14, 16, 18, 20-21, 25 and 34 as being dependent, either directly or indirectly, from one of the independent claims discussed above, include all the limitations of the independent claims from which they respectively depend. Accordingly, for at least these reasons, these claims are also allowable over the art of record for the same reasons set forth hereinbefore, as well as the additional limitations recited. These additional limitations will not be addressed at this time because a prima facie case has not been established against the independent claims.

Claims 22-24, 27-29, and 31-33

Applicants submit that claims 22-24, 27-29, and 31-33, as being dependent, either directly or indirectly, from one of the independent claims discussed above, and therefore, include all the limitations of the claims from which they respectively depend. As discussed above, the Examiner relies upon Khatri to teach and suggest the orthogonalizing of spatial channels. Khatri does not teach nor suggest this and Zhuang, the other prior art cited by the Examiner, does not compensate for the deficiency of Khatri. Further, Crilly also does not compensate for this deficiency. Accordingly, these claims are also allowable over the art of record for the same reasons set forth hereinbefore, as well as the additional limitations recited therein. These additional limitations will not be addressed at this time because a prima facie case has not been established against the independent claims.

Claims 5-6, 13 and 17

Claims 5-6, 13 and 17 have previously been cancelled without prejudice, thus rendering their continued rejection moot.

REQUEST FOR ALLOWANCE

In view of the foregoing, Applicants submit that all pending claims in the application are patentable. Accordingly, reconsideration and allowance of this application are earnestly solicited. Should any issues remain unresolved, the Examiner is encouraged to telephone the undersigned at the number provided below.

Respectfully submitted,
QUALCOMM, Incorporated
Customer No. 23696

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By: /Ross L. Franks/
Ross L. Franks, Reg. No. 47,233
Telephone: 858-845-1946

QUALCOMM Incorporated
5775 Morehouse Drive
San Diego, California 92121
Telephone: (858) 651-4125
Facsimile: (858) 658-2502